

Cultivating Whole-Class Inquiry

Technology can be used in several ways to reconceptualize teaching and learning. A one-to-one paradigm assumes that each student has an interactive learning device, often used in support of individualized instruction. This dream began with the Plato project in the 1960s and is continuing through pilot explorations with handheld computers, laptops, and tablet computers today.

Technology can also be used to reconceptualize teaching and learning in a classroom setting. This strategy, which focuses on using technology to facilitate learning in a whole-class setting, might be termed a one-to-many paradigm. In one-to-many paradigms, several students or an entire class may use a computer and an interactive display system as a tool for facilitating group inquiry and discourse.

The majority of instruction in schools still occurs in the classroom. Yet, ironically, the majority of technology use currently takes place outside the classroom. In fact, the 2002 Pew Foundation report *The Digital Disconnect* reports “For the most part, students’ educational use of the Internet occurs outside of the school day, outside of the school building, outside the direction of their teachers” (<http://www.pewinternet.org/pdfs/PIP-schools-internet-report.pdf>).

Three related articles in the Learning Connections section (pp. 45–55) consider how technology might be used to facilitate whole-class inquiry in science, mathematics, and social studies classrooms. We hope these illustra-

tive examples will stimulate thought and discussion among teachers, technology coordinators, and school leaders about how best to employ these technologies in classrooms that are equipped with these capabilities.

Computing in the Classroom

Computing in the classroom, built around the one-to-many paradigm, was one theme discussed at the most recent National Technology Leadership Summit (*Editor’s note:* See The Research Agenda on p. 43). Susan Patrick, director of the Office of Educational Technology in the U.S.

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Department of Education, was one of the presenters. In her address, she observed that a typical student has fewer than 30 minutes of computer access per week in school. She contrasted this with the extensive access to technology outside of school that has been documented in numerous studies.

Because the paradigm of teachers working with groups of students in classrooms is so central to the current educational system, classroom teaching has been the subject of an intense research focus. Almost every aspect of classroom teaching has been examined. However, research on effective use of technology in the classroom is conspicuously absent.

We are approaching a golden age of classroom technologies. An unprecedented investment has linked the Internet to the majority of classrooms in the United States in a remarkably short period of time. Technological breakthroughs have produced affordable solid-state projection systems designed for classroom use that are visible even with the room lights on. A plethora of digital imaging devices, such as digital cameras, Web cams, and digital microscopes, have also become available.

Ironically, at a time when the potential is greatest, the climate of increased focus on accountability makes it more difficult for teachers to explore innovative approaches to learning. For that reason, research on best practices for increased student achievement and learning with technology in whole-class settings is needed more than ever.

Appropriate New Uses

When new media and capabilities emerge, they are often employed in the same manner as the traditional media that preceded them. For example, when cinema first emerged, the camera was initially used to film staged plays from a static position. These efforts were even termed pho-

toplays. Later it became apparent that the camera could be dynamically shifted and even moved outside into the world at large. Similarly, in business, the predominant use of a computer and projector is to mimic the bulleted lists and static charts previously presented with overhead transparencies.

The combination of a computer and a display system makes it possible to display change over time dynamically. If the information flow represents the axis of one continuum, another important continuum is represented by student participation and engagement.

An effective instructor uses the full range of this continuum over the course of a lesson, providing necessary foundational information as scaffolding for the concept, but also engaging students in dialogue to adapt the course of the lesson as needed.

These tools can provide dynamic, interactive representations of relationships. In the hands of a prepared teacher, these capabilities can facilitate understanding and engage students in ways that go beyond what is possible in a classroom equipped only with a blackboard.

However, in addition to the cost of the initial purchase and time required to learn new tools, it will also be important to recognize the time it takes to reconfigure lessons, build new types of activities, and modify assessments that make effective use of new classroom technologies. Early adopters who are comfortable with technology, pedagogy, and content engage in development and experimentation, but this occurs less often and less systematically than we might like.

Need for Effective Models

In an era of accountability, it will be important to consider how these systems can best facilitate student inquiry and enhance learning. Factors affecting this include technological

capability, pedagogy, content, and teacher preparation.

Recommendations regarding best practice should be grounded in research. It is desirable to achieve consensus that scientific research is needed that will clearly identify best practices and the conditions under which this research might best be conducted.

This depth of research has rarely, if ever, been undertaken for a technological innovation in schools. Generally, innovations such as blackboards, overhead projectors, computer laboratories, and Internet connections have been installed without discussion of what might constitute evidence of effective use.

Summary

The rapid diffusion of Internet connections, projectors and whole-class display systems, interactive whiteboards, electronic polling systems, and other emerging technologies allows the modern teacher to do much more than ever before. At present only a fraction of the full capabilities of the interactive classroom are being employed. Guidelines and illustrations of effective use in one-to-many settings are needed, along with further research into best practices. The curriculum articles that follow offer an initial starting point for a dialogue about use of interactive technologies to facilitate whole-class inquiry.



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